# Dr. Marin Moran

AI Research Leader & Technical Architect

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## SUMMARY

I design and build machine learning systems for geometrically structured data such as graphs, point clouds, and atomic configurations, where the underlying symmetries are key to reliable neural systems. My PhD focused on symmetry-aware geometric deep learning, building invariant representations of physical systems and scaling the training across HPC clusters using custom CUDA kernels. I now work at Electronic Arts SEED on real-time generative AI that has to run within strict frame-time budgets, alongside combining my technical expertise with creative vision to pioneer new experiences. I also advise frontier AI labs on how to evaluate scientific reasoning in their models, which matters most when ground truth is expensive to obtain and binary correctness fails to capture what good reasoning looks like. I'm drawn to problems where correctness is hard to verify and where ideas from one field can unlock advances in another.

## EXPERIENCE

**Electronic Arts (SEED)**, *AI, Physics, and Rendering Research Scientist* Oct 2024 – Present

*Remote, Global*

*Real-time generative AI and LLM research for AAA games*

- Designed novel neural network architectures for real-time generative systems operating under production frame-time budgets, with substantial reductions in memory, register pressure, and ALU cost against deployed baselines and no loss of output quality
- Served as technical lead for LLM integration in real-time interactive systems, driving architecture design, fine-tuning methodology, and evaluation framework design across research and production teams
- Led cross-functional research into LLM-powered experiences that could not have existed before, with full ownership from conceptualization to working prototype
- Solved a 50 year old problem in sparse rendering by bringing over machinery from the physics of glass (SIGGRAPH ASIA 2026)

**Solomonoff Consultancy**, *Founder & Principal Consultant* Feb 2024 – Present

*Remote*

*Boutique consultancy designing verification and evaluation frameworks for scientific reasoning in frontier AI systems*

- Designed verification frameworks for scientific domains where ground truth is expensive to obtain and binary correctness fails to capture what good reasoning looks like. Advised on and implemented benchmarks that test whether models have learned to do science rather than memorize it
- Led the design and delivery of PhD-level verification datasets for frontier AI models, coordinating 100+ domain experts across physics, chemistry, and drug discovery, and personally authoring a substantial volume of expert-level challenges. These datasets now power frontier model capabilities
- Provided strategic guidance on AI alignment and responsible deployment to frontier AI organizations, translating philosophical and technical safety literature into actionable frameworks for production systems

**University of Liverpool, Materials Innovation Factory**, *Post-Graduate Machine Learning Researcher* Oct 2019 – Oct 2024

*Liverpool, UK*

*Symmetry-aware geometric deep learning for physical systems*

- Designed Site-Net (Digital Discovery, 2023), a transformer architecture for learning invariant representations of crystal structures where the input is an infinite periodic graph with no canonical ordering. Combined global self-attention over real-space supercells with explicit symmetry-aware constraints to capture long-range interactions
- Established Deep InfoMax, which maximizes mutual information between local and global representations, as an effective self-supervised methodology for domains where reconstruction-based approaches are intractable (Digital Discovery, 2025)
- Scaled training across SLURM clusters using DeepSpeed, custom CUDA kernels, and symmetry-aware optimizations via

PyTorch Geometric, and built bespoke data architectures for high-throughput multi-GPU pipelines
- Co-built a locally hosted cloud service for deploying supervised materials-informatics models, used by the Materials Innovation Factory research group

**Electronic Arts**, *Physics Software Engineer (Internship)* Sep 2023 – Mar 2024

*Guildford, UK*

*Memory optimization and legacy code modernization for physics systems*

- Achieved significant memory optimizations through core data architecture redesign, reducing memory requirements by approximately 50% for typical workloads
- Built an in-engine documentation interface that surfaced the physics system's internals to non-specialist developers across the studio
- Designed and shipped a production agentic system on GPT-3 for legacy codebase modernization, combining LLM-driven refactoring with symbolic verification to keep changes safe under deployment

## EDUCATION

**University of Liverpool**, *PhD, Deep Learning for Materials Science* Oct 2019 – Sep 2024

*Liverpool, UK*

- Doctoral thesis, An information oriented approach to materials informatics
- Published 4 papers in top-tier journals (Digital Discovery, npj Computational Materials, Angewandte Chemie)

**University of Liverpool**, *Integrated Masters (First Class Honours), Physics* Sep 2015 – May 2019

*Liverpool, UK*

- First Class Honours
- Focus on computational physics and machine learning applications

## SKILLS

**Languages & Frameworks.** Python, C++, MATLAB, C#, Java, CUDA, JavaScript, PyTorch (Lightning), TensorFlow/Keras, JAX, Scikit-learn, PyTorch Geometric, Hugging Face, DeepSpeed, NumPy, Pandas, SciPy, Ray, XGBoost, ONNX

**AI/ML Specializations.** Large Language Models, Transformer Architectures, Deep Learning, Representation Learning, Generative AI (Diffusion Models, VAEs, GANs), Graph Neural Networks, Geometric Deep Learning, Contrastive Learning, Neural NLP, Computer Vision

**Systems & Infrastructure.** HPC (SLURM), Distributed Training, GPU Compute (CUDA Kernels), OpenMP, Graphics Programming (HLSL, GLSL), Real-time Physics Simulation, Game Engines (Unreal, Frostbite, Unity), Docker, Singularity, MLOps, Azure, Full Stack Development, Agentic Systems, MongoDB, SQLite, HDF5

**Domain Expertise.** Materials Science, DFT (Density Functional Theory), Molecular Dynamics, Crystallography, VASP, ASE (Atomic Simulation Environment), Frontier AI Safety, Scientific AI Verification, Real-time Game AI, Physics Simulation, Computational Chemistry, Low-level Systems (6502 Assembly, C++/CLI)

**Game Development.** Unreal, Unity, Frostbite, Perforce

## INTERESTS

**Creative Pursuits.** Tabletop RPG design and community coordination, Vocal performance (classical and extended techniques), Retro game development (6502 assembly for NES)

**Philosophy & Ethics.** Philosophy of technology, Applied ethics and moral philosophy, History of ideas

**Quantitative Hobbies.** Market microstructure, Network dynamics, Complex systems modeling